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Interactive comment on "Localized TEC enhancements in the Southern Hemisphere" *by* Ilya K. Edemskiy

Anonymous Referee #2

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Title: Localized TEC enhancements in the Southern Hemisphere

Author(s): Ilya K. Edemskiy

The paper presents the results of registering localized TEC enhancements (LTEs) in the Southern Hemisphere. In my opinion, the author has detected interesting phenomenon that has received no attention before. However, some aspects should be refined. The paper is suitable by topic for Annales Geophysicae and may be accepted for publication after some revision.

General Comments

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Discussion paper

1. It is not clear from the text what the author regards as a possible mechanism of LTE generation. A possible mechanism of LTE generation should be one of the main conclusions in section 4. The author is obviously not yet able to indicate the exact mechanism. However, he should single out and discuss possible mechanisms.

2. As I believe (see Comment for Line 163), the author uses the intensity of the interplanetary magnetic field (IMF) to analyze LTE dependence on geomagnetic activity level. But for this analysis, it is better to use the magnetic activity indices Dst (or SYM-H) and AE, which make it easy to select disturbance periods in Earth's magnetic field variations. In addition to Figures 4 and 5, it would be useful to add a figure to show the time variations of Dst, AE, F10.7 and "temporal position" of each LTE during all the years (2014, 2015, 2018).

3. Throughout the text, please check the season names in the Southern Hemisphere: in some places March-July are called "autumn-winter" (Lines 143-144, 187-188), and in other places they are referred to as "spring-summer" (Lines 148-149, 227-228).

Comments

Lines 5-6. In Abstract, it is not clear what the author means by "LTE series". Please keep in mind that a lot of people read Abstract only.

Lines 7-8. "It is shown that LTE intensity varies in dependence on solar flux and does not directly depend on interplanetary magnetic field orientation." LTE dependence on interplanetary magnetic field orientation is not discussed in the paper. See also Comments for Line 231.

Lines 19-25. "The Southern Hemisphere contains at least two large anomalous regions: South Atlantic Magnetic Anomaly and Weddell Sea Anomaly." Since the author mentions two large anomalous regions in the Southern Hemisphere (South Atlantic Magnetic Anomaly and Weddell Sea Anomaly), he should characterize both of them, not one (Weddell Sea Anomaly).

Moreover, I would recommend to pay particular attention to the South Atlantic Magnetic Anomaly (SAMA). The SAMA region is very close to the area where LTEs are detected (Fig. 1A and Fig. 3). Perhaps SAMA (itself or together with some other factors, such as a neutral wind, for example) promotes the LTE formation.

On the other hand, LTE looks like a continuation of the region occupied by the Equatorial Ionization Anomaly (EIA) in Fig. 1A (unfortunately, the boundaries of Fig. 3 cut off the EIA, and nothing can be said here). Maybe sometimes one get conditions that allow a plume from EIA "fountain" to reach higher latitudes.

Lines 32-33. "However, none of these models predict the occurrence of the LTE phenomenon." Neither the abbreviation "LTE" nor the term "LTE" have been used before. Please, explain what "LTE" is before using it. In a scientific article, one should avoid term/abbreviation explanations after their first use. This makes understanding difficult.

Line 48. "Gradients at an LTE edges should be high enough to make LTE borders possible to distinguish." Please, specify the numerical value of the gradient threshold you use.

Line 54. "Edemskiy et al., 2017" Probably, the author meant "Edemskiy et al., 2018"

Lines 125-126. "Blue dashed line (Fig. 2, right) presents a profile measured at 10:12 UT at October 19, 2014 when there was no LTE observed in GIM." Please, explain why October 19, 2014 was chosen as a day without LTE. Though April days with LTE are analyzed. Why did not you use a day without LTE closer to April?

Lines 133-134. "The intensity and the shape of the presented LTEs vary but at the same time of day all of them occupy the same region." should be replaced with "The intensity and shape of the presented LTEs vary from day to day, but at the same time of day all of the LTEs occupy the same region".

Lines 137-138. "In a similar way LTE series were observed during other investigated years of relatively high (2015) and low (2018) solar activity." It is necessary to clarify

what the level of solar activity was in 2014 and what index was used for the solar activity characteristic. The author should also indicate numerical values of the solar activity level for each year. Please, explain what "LTE series" is.

Line 163. "distribution of this ratio vs IMF intensity." Please, explain: - what "IMF" is; - what "IMF intensity" is: whether it is B intensity or Bz intensity;

Line 178. Article [Cherniak et al., 2012] is not included in References.

Line 225. "5 Discussion" Probably, the author meant "5 Summary".

Line 231. "No clear dependence between orientation of IMF and LTEs' parameters was observed." LTE dependence on interplanetary magnetic field orientation is not discussed in the text. Therefore, this conclusion is not substantiated.

Lines 240-305, References. Articles [Afonin et al., 1995], [Chen et al., 2011], [He et al., 2011], [Krankowski, et al., 2009], [Matyjasiak, et al., 2005], [Sun, et al., 2017] are not mentioned in the text.

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